

Missouri Department of Natural Resources

## Total Maximum Daily Load Information Sheet

### Center Creek

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#### Waterbody Segment at a Glance:

**County:** Jasper  
**Nearby Cities:** Joplin  
**Length of impairment:** 11 miles  
**Pollutant:** Zinc  
**Source:** Tri-State Abandoned  
Mine Land (AML)



State map showing location of watershed

**TMDL Priority Ranking:** EPA Approved 2006

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#### Description of the Problem

##### Beneficial uses of Center Creek

- Livestock and Wildlife Watering
- Protection of Aquatic Life (Warm-Water Fishery)
- Human Health Protection (Fish Consumption)
- Cool-Water Fishery
- Whole Body Contact Recreation
- Secondary Contact Recreation
- Irrigation
- Industrial

##### Use that is impaired

- Protection of Aquatic Life (Warm-Water Fishery)

##### Standards that apply

- Missouri's Water Quality Standards (WQS) for zinc can be found in 10 CSR 20-7.031 Table A. The applicable standard is dependent on the hardness of the water and follows the formula:

Acute:  $e^{(0.8473 \cdot \ln(\text{Hardness}) + 0.884211)} \cdot 0.978 = \mu\text{g/L}^1$  of Dissolved Zinc

Chronic:  $e^{(0.8473 \cdot \ln(\text{Hardness}) + 0.785271)} \cdot 0.986 = \mu\text{g/L}$  of Dissolved Zinc

Using a hardness of 147 mg/L, the zinc target for the Center Creek watershed (as Missouri's chronic criterion) is 148  $\mu\text{g/L}$  as dissolved zinc. For comparison, Kansas' acute and chronic criteria are 150  $\mu\text{g/L}$  as total recoverable zinc.

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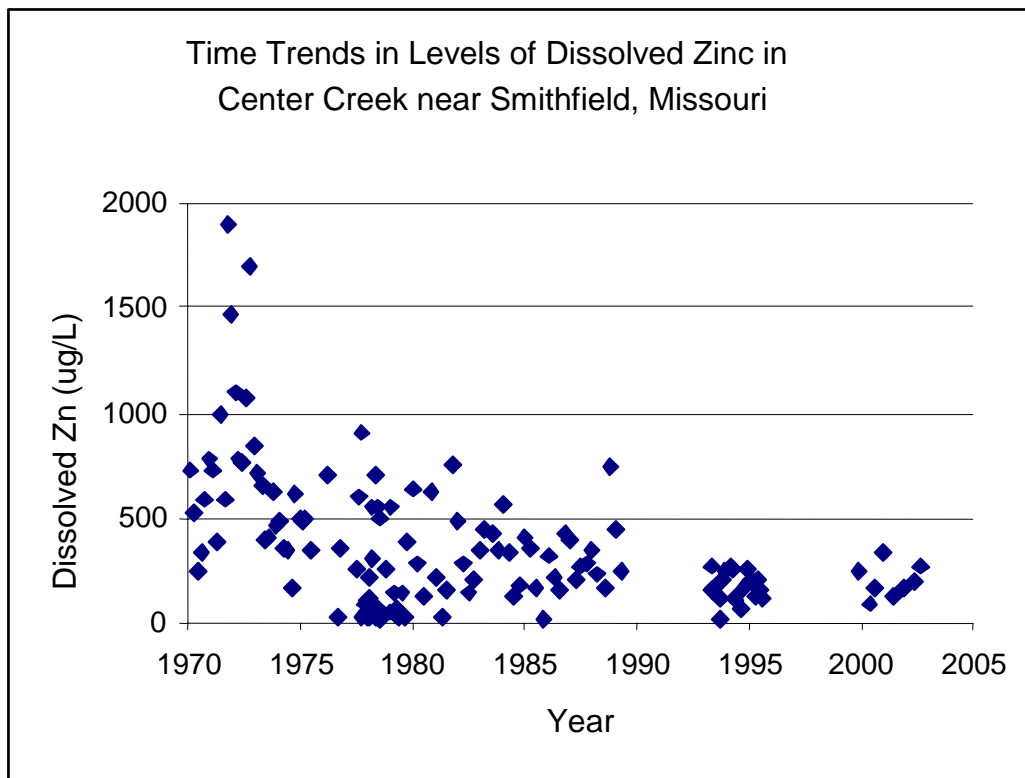
<sup>1</sup>  $\mu\text{g/L}$  = micrograms per liter, which is the same as parts per billion

### Background Information and Water Quality Data

Center Creek flows through the Tri-State Historic Mining District in southwest Missouri. Joplin is located near the center of this district. Mining for lead and zinc began in 1848 and lasted until 1957. Between 1848 and 1945, 50 percent of the zinc and 10 percent of the lead mined worldwide came from the Tri-State district.

Mine drainage, both in the form of surface flows and resurgence of groundwater from flooded mines, contributes significant amounts of zinc to Center Creek. Upstream of the mining district (near Fidelity) the average dissolved zinc concentration in Center Creek is 7 µg/L. At the Highway HH bridge, which is just within the upstream portion of the mining district, it is 124 µg/L and rises to 366 µg/L well within the mining area at Smithfield. Studies by the U.S. Geological Survey (USGS) also indicated that pore water, water within the sediment on the bottom of Center Creek, at some locations was toxic to aquatic life. The results of these toxicity tests correlated with amounts of zinc in the stream sediments, and therefore, zinc is believed to be the toxic agent.

Most of the zinc in Center Creek comes from dissolution of zinc minerals lying on the land surface or in the walls of flooded mines. As these surfaces continue to weather, less available zinc minerals remain to be dissolved. As a result, the long-term levels of zinc in runoff, groundwater and Center Creek should decline. This trend is shown in the graphic below that plots dissolved zinc levels in Center Creek near Smithfield from 1970 to 2002.

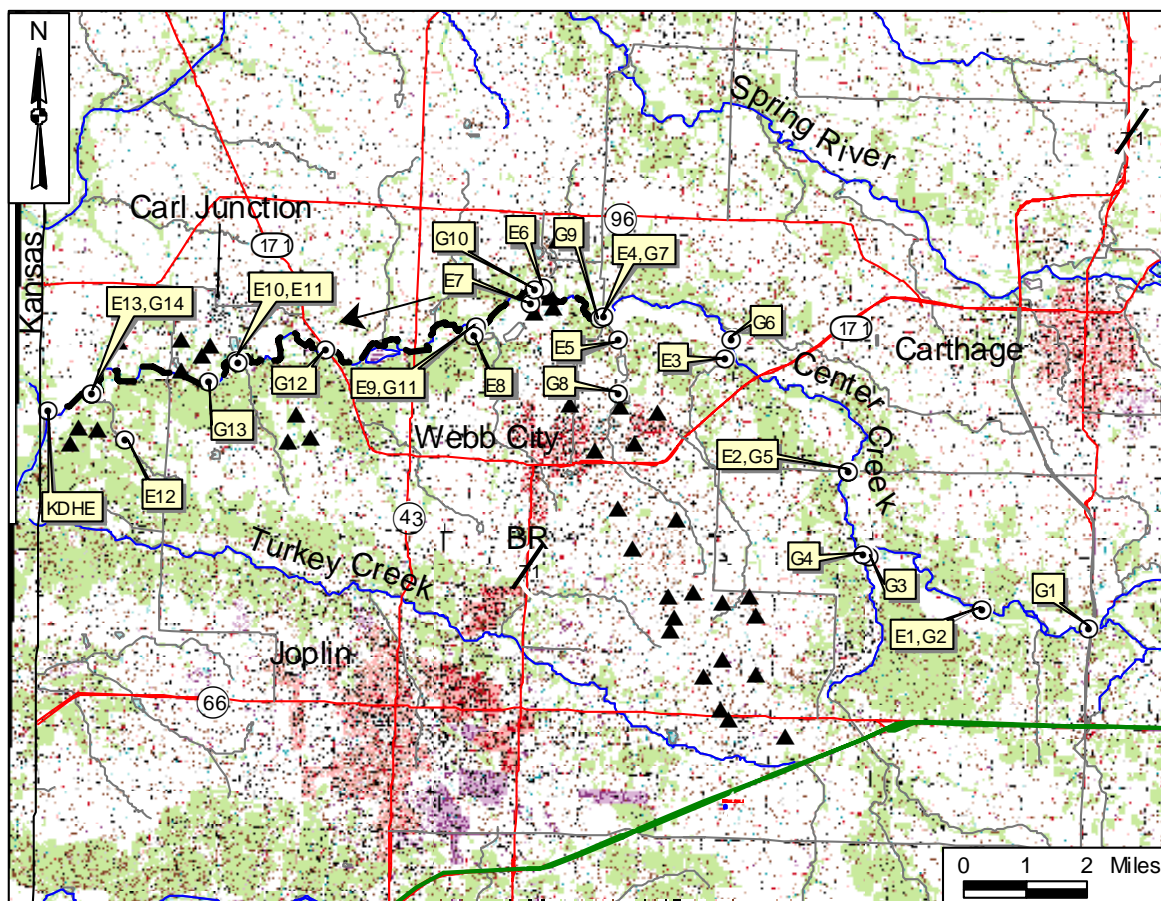


Center Creek and nearby Turkey Creek in Jasper County flow across the state line into the Spring River in Kansas. Kansas has completed a TMDL study on the Spring River. The two creeks are major sources of metals pollution in the Spring River. As a result, Missouri chose to include Kansas' WQS in the target for these TMDLs. The Environmental Protection Agency (EPA) approved these TMDLs on October 25, 2006.

For more information on this, see the [Turkey Creek](#) Information Sheet.

EPA and USGS collected data on Center Creek at the sites shown in the map below. This data is displayed in the two graphs that follow.

**Center Creek in Jasper County, Missouri, Showing the Impaired Segment and Sampling Sites**



--- Impaired Segment      ▲ Mine tailings      ← Direction of flow

The site indices are on the next page.

### **Index to Sites**

#### **US-EPA**

- E1 – Center Creek 2 miles below Fidelity
- E2 – Center Creek at Highway HH 1.5 miles below Grove Creek
- E3 – Stout's Branch near mouth
- E4 – Center Creek 0.1 mile above Mineral Branch
- E5 – Mineral Branch 0.5 mile above mouth
- E6 – Tributary to Center Creek at Oronogo, near mouth
- E7 – Malibu Pit resurgence
- E8 – Center Creek 1.5 miles below Oronogo Branch
- E9 – Tributary to Center Creek 1.5 miles below Oronogo, near mouth
- E10 – Center Creek at Carl Junction
- E11 – LBD Tributary to Center Creek at Carl Junction
- E12 – LBD Tributary to Center Creek 1 mile below Klondike mines
- E13 – Center Creek near Smithfield, 10 miles below Oronogo

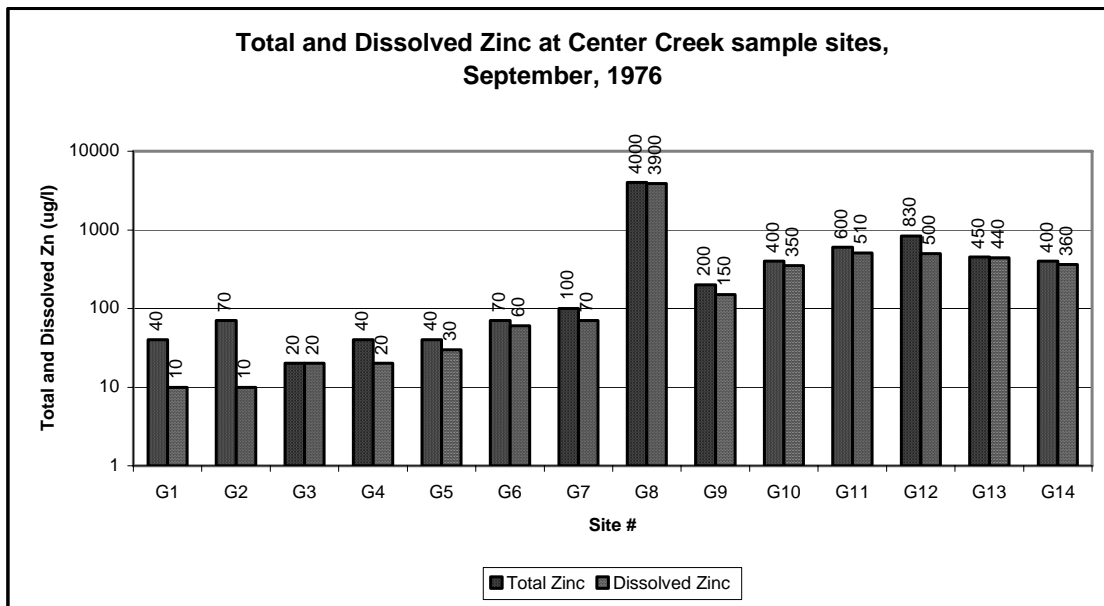
### **Index to Sites (cont.)**

#### **USGS**

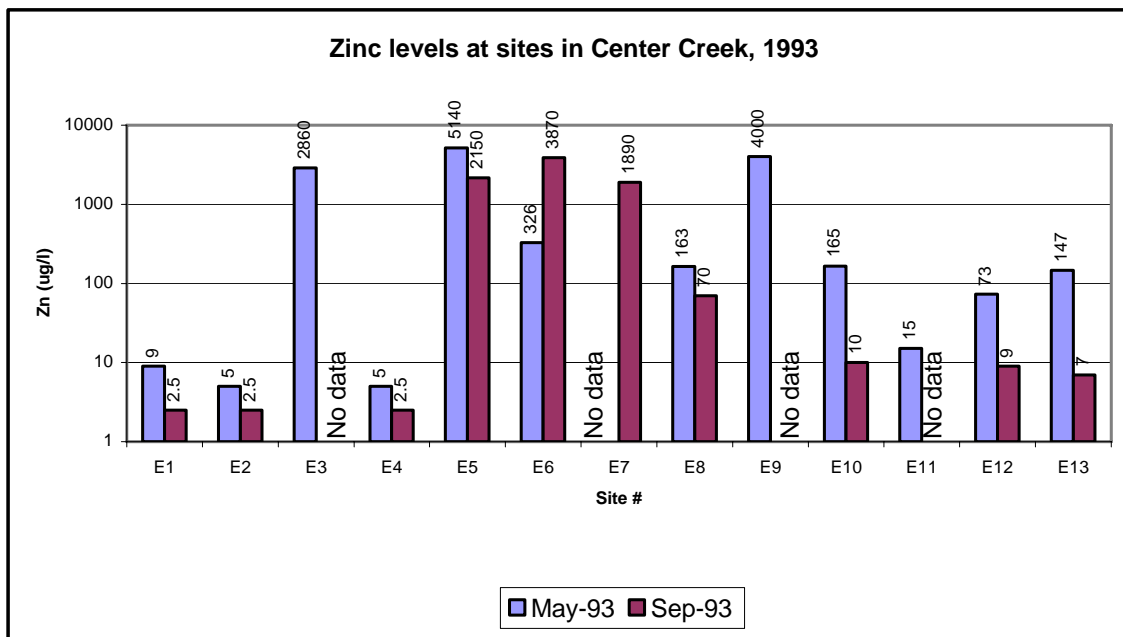
- G1 – Center Creek at Hwy Alt. 71 near Fidelity
- G2 – Center Creek 2.5 miles below Fidelity
- G3 – Center Creek 0.1 mile above Grove Creek
- G4 – Center Creek 0.1 mile below Grove Creek
- G5 – Center Creek at Hwy HH 1.5 miles below Grove Creek
- G6 – Center Creek 0.1 mile below Stout's Branch
- G7 – Center Creek 0.1 mile above Mineral Branch
- G8 – Mineral Branch 2 miles above mouth
- G9 – Center Creek 0.1 mile below Mineral Branch
- G10 – Center Creek 0.1 mile below Oronogo Branch
- G11 – Center Creek 1.5 miles below Oronogo Branch
- G12 – Center Creek 4.5 miles below Oronogo Branch
- G13 – Center Creek at Carl Junction 8 miles below Oronogo Branch
- G14 – Center Creek near Smithfield, 10 miles below Oronogo Branch

#### **Kansas Department of Health and Environment**

- KDHE – Center Creek near Smithfield



Source: US Geological Survey



Source: U.S. Environmental Protection Agency

Many data were not included in this Information Sheet due to space constraints. For more recent data, see the assessment sheet for the 2004-06 303(d) List at:  
<http://www.dnr.mo.gov/env/wpp/waterquality/303d/2006pn/proposed-2006-303d-list-data.htm>

For all of the data used to calculate the TMDL, please refer to Appendix D in the TMDL document.  
<http://www.dnr.mo.gov/env/wpp/tmdl/3203-center-3216-3217-turkey-cks-tmdl.pdf>

**For more information call or write:**

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